needed to prove the extent and quality of the ores located. This work has gone till now rather tardily, owing to the inadequate funds at the disposal of the Directorate General on Minerals. There also seems to be no clear policy as to how this wealth should be exploited: whether by the State directly or by concession to national or foreign enterprise. 135

Another factor delaying work in this field is the difficulty of transport to and from the sites of the ore deposits which are remotely situated in desert and mountain. [489]

Oil and gas are indeed plentiful in Iraq, and the exploitation of oil resources has indirectly helped to finance the industrial development so far achieved. But the cost of oil fuel and other oil products for local consumption is not much lower than in other countries because of the high rate of taxes on consumption. This and the limited range of oil products so far made in Iraq by the Alwand refinery, owned by the Anglo-Iranian Oil Co., have led to the import of a number of oil products from abroad. But the situation should change when the State-owned refinery, now under construction, goes into production. 382

Another problem connected with the supply of fuel is the lack of electric power. Power generation in Iraq is inefficiently organised and power rates, except in Basrah and Baghdad in recent years, are among the highest in the world. This has compelled most industries to generate their own power which has added a great deal to production cost. The recent reduction of power rates and the availability of electricity in Baghdad has been one of the major reasons for the concentration of industry in that city. 371

(3) **Concentration of Industry**: Industry in Iraq is heavily concentrated in the city of Baghdad which has a population of 550,000 inhabitants, in other words a little more than ten percent of the country's population. Excluding oil and one or two small textile, tanning, and grain-milling industries, all modern industry has been established in or near Baghdad, thus adding to the population and housing problems of the capital. There are many reasons for this concentration of industry. All routes converge on Baghdad; it has the largest population and, as the seat of Government, it offers easy access to the central authority. As an old trading centre Baghdad has a well-organised market, large financial resources, and managerial and office staffs. Some of the factors that have made Baghdad 438 [366]

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majority needs substantial improvement. The Department of Municipalities has drawn up a five-year program to provide or extend water supply systems for 114 municipalities with a total population of 943,000 people. Since such water systems are technically simple and the need is great, the Mission suggests that the Department be authorized to proceed with this program. Water supply systems for villages must, of course, be simple and inexpensive. In some cases, wells may prove to be the solution, although frequently brackish water is encountered; in other cases, water piped from a stream or canal with the help of a small pump and run through simple filters may be possible.

Outside of Baghdad and Basra municipal power plants are generally inadequate, and a considerable number of municipalities with a total population of 175,000 have no electricity at all. Baghdad and Basra, which together account for a generating capacity of 51,000 kilowatts, have a sufficient supply; and Kirkuk is adequately supplied from the large power plant of the Iraq Petroleum Company. Total generating capacity available in the remaining municipalities, however, is only 14,000 kw. A program for the expansion of this capacity and the provision of electricity for all municipalities would involve the installation of generators with an aggregate capacity of 10,000 kw. It would be desirable to proceed with such a program, provided simultaneous steps were taken to improve the management of municipally-owned power plants outside Baghdad and Basra. In these two cities the power plants are owned and managed efficiently by a private company and the Port respectively. At present the machinery in the plants of other municipalities is poorly maintained and little or no attention is paid to depreciation. Power "losses" are as high as 36 percent compared to not more than eight percent in Baghdad and Basra; and the rates charged range from 30 to 55 fils[4] per kw-hr as contrasted with 18 fils and less in Baghdad and Basra. To remedy these evident deficiencies it is recommended that serious consideration be given to entrusting the management of such plants to a competent private firm like the Baghdad Light and Power Company.

The Mission does not believe that it would be economic to develop hydroelectric power at present. The capital cost of hydro-

[4] One dinar equals one thousand fils.

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sures of production and assistance which tend to shield industry against competition. There is much to be done to help industry to achieve better control of the quality of its products, in reducing waste through material salvage, in analyzing production costs, in making market surveys and in raising labor efficiency through improved lighting, noise abatement, in-plant training programs and better work flow.

IV. Other Suggestions for the Improvement of Industry

Possibilities for Economies in the Use of Capital

Whenever the capital cost of a plant is an important determinant of production costs, it becomes essential to utilize the plant to the fullest extent. This may be accomplished, for example, by increasing the number of shifts, by extending the work week and by stepping up machines to their maximum economic speed. Completely integrated plants seldom if ever offer the opportunity for this type of operation, because certain machines are never called upon for continuous use. This is, of course, very noticeable where the plant does all its own maintenance work, even to all of its foundry items. The solution is obviously one of resorting to contracting or sub-contracting with concerns specializing in particular operations. For example, a single finishing and dyeing concern might advantageously serve two or more textile mills, where the capacity of these mills is insufficient to load separate finishing departments to their economic limit.

In Iraq there is a tendency in industry to generate its own power rather than to purchase it. This leads to the installation of expensive facilities which are utilized only part of the day. While industry is operating, many municipal power plants stand virtually idle because they serve primarily lighting needs and their peak load accordingly comes at night. In some cases, where large quantities of process steam are needed, industrial enterprises may be justified in generating their own power, but for the most part, the purchase of power is preferable. Unfortunately, power rates, except in Basra and Baghdad, are so high that the purchase of

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365 The initial step might be to carry out the plan for the east
364 bank according to a schedule based on the relative importance of its various elements. It would be useless, however, to proceed unless connections with the system are made compulsory for all property owners. No new constructions or major building alterations or enlargements should be permitted without adequate provision for such connections. Existing structures which are connected to the water supply system should be required to connect gradually to the sewer, according to a scheme to be worked out by the government and based on sanitary, engineering and financial considerations. The administration of the sewage system would logically come under the jurisdiction of the Water Board. The system might be made to help pay for itself by setting a certain surcharge over the cost of water actually used and then discharged into the system.

For the other larger cities, surveys should be conducted now to gather the data necessary for the actual design of each system. For example, the preliminary studies for the sewage problem of the City of Mosul should be preceded by a topographic survey. It is believed that the entire flow of the sewage and rain water could be designed so that no pumping will be needed. Chemical treatment of the sewage is to be preferred to discharge into the Tigris, because people living in downstream villages get their drinking water directly from the river.

For the smaller towns and villages, efficient and inexpensive individual sewage disposal units should be installed privately according to models prepared and tested by the government. Community bath and toilet facilities should be provided in the poorer sections of towns to supplement private individual units. Public lavatories should also be provided in the cities wherever there are concentrations of people, such as in business areas, parks and other public places.

Electric Power

365 Municipal power plants serve primarily public and domestic
377 lighting needs. Most industrial plants supply their own power. Cheap fuel also makes it possible for small direct-connected diesels to compete favorably with electric motors as prime movers, pri-

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marily because the capital cost of all the electrical equipment is eliminated. It is chiefly for this reason that there are over 3,000 large diesel-driven irrigation pump installations along the Tigris and Euphrates Rivers, many of them very close to electric generating stations. In a similar manner, most of the older industrial enterprises and even many of the new ones have followed the same practice of using diesel engines as a source of power. In the field of public transportation, diesel or gasoline engines are universally used as a means of motive power, while kerosene and other fuels meet the country's needs for domestic heating and cooking. It is not surprising, therefore, to find the development of electric power to be on a very small scale and the per capita consumption among the lowest in the world; the total generating capacity in utility plants operating for public use is not more than 65,000 kw. Of this 42,000 kw. serves the city of Baghdad and 9,000 kw. is at Basra

Production and distribution of electricity in Baghdad are carried on by the Baghdad Light and Power Company and in Basra by the Port Authority. In Kirkuk the municipality receives its power from the Iraq Petroleum Company's large plant but is responsible for distribution. In all other municipalities, the electricity system is run by the local Electricity Board.

Recent expansions by the Baghdad Light and Power Company and by the electric plant in Basra appear to be adequate for the immediate future, unless new industries or other heavy loads create power demands beyond those now anticipated. Apart from Kirkuk, however, the remaining municipalities are badly in need of power. To meet this need, the Department of Municipalities has established a plan of development which is very practical. This plan calls for the construction of new plants in approximately 56 municipalities having an aggregate population of 175,000 and the expansion of existing plants in 47 municipalities having an aggregate population of approximately 750,000. All plants would be based on the use of relatively small, slow-speed, heavy-duty, diesel-engine generators having a combined capacity of not over 10,000 kw. Fortunately, many of the generating units would be identical, permitting standardization and allowing maintenance to be carried out by central repair facilities. It is estimated that the total cost including

489 needs of the southern districts are particularly acute:
653 as yet they possess only roads which are not prac-
[491] ticable for any traffic, still less for heavy motor traffic, during the rainy season and for a long time afterwards, and boat-bridges of a very old—almost antediluvian—type across the Euphrates and other rivers.

[508] The government is taking steps to modernize the Baghdad and Basra-Ma'agil airports (the latter, in addition to its modern technical installations, has had since 1937 an air-conditioned hotel, swimming pool, tennis courts, etc.). The aim is to make them into first-class international airports. In addition, a training school for civilian air pilots was established in Iraq in 1937.

● 377 As the country lacks hydroelectric power stations, in spite of the existence of various large dams, there is now a plan to utilize the Bekhme dam for the generation of electric power.

315 In the expectation of the return of normal political conditions in the Near and Middle East, the

[8] It is interesting to note that for the Basra—Baghdad section (568 km), these coaches are placed on special 1-metre bogies.